

Abstract

Performance of the SIR-C Synthetic Aperture Radar System

R. Jordan

Mail Stop 300-243  
Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, Calif. 91109  
Tel: (81 8) 354-4442  
Fax: (818) 393-5285  
e-mail: [rjordan@sorata.jpl.nasa.gov](mailto:rjordan@sorata.jpl.nasa.gov)

The SIR-C Synthetic Aperture Radar System is a two frequency full polarization Synthetic Aperture Radar System flown in conjunction with the German/Italian **X-SAR** system on the Space Shuttle in April and September of 1994. The SIR-C instrument was unique in that it is the first radar instrument designed to operate at multiple frequencies and polarizations with an electronically steerable antenna. SIR-C has a fully active distributed array that can steer the illumination beam as well as shape the illumination pattern on the ground. Benefits of this architecture is that the radar system is tolerant to failures in the transmit and receive elements distributed in the antenna. This system architecture has an added advantage in that, because the transmit elements are at the antenna radiating elements, the resulting system has a very high antenna efficiency. This architecture when factored into the large electrical power capability of the Shuttle, gives a system whose detection sensitivity is very high. This paper describes the system level performance achieved by both the L- and C-Band systems in their various configurations. The impact of antenna element failures encountered during these missions on overall system performance are discussed. The operational limitations encountered during these missions are discussed. Results presented indicate that most of the performance requirements were **acheived**. The complexity and flexibility of this system posed challenges to configuring the radars correctly for data acquisition. The approach to setting up this complex radar during the mission is also discussed.